

hour earlier during the month of October on account of darkness, there being no way of lighting the building artificially.

The exhibit was visited by many thousands of people, among whom were meteorologists and those interested in related sciences from all parts of the civilized world. The cloud photographs, the method of making weather forecasts, and the kite and aerial apparatus attracted special attention.

Many interested in aeronautics and air explorations examined the kite exhibit in detail, taking photographs and measurements of the kite, instruments, and apparatus. Notably among these were a number of officers of the German, French, Italian, and Japanese armies and navies.

During the meeting of the International Meteorological Congress, which brought to Paris representative meteorologists from nearly all parts of the world, a special invitation was extended to its delegates and members to visit and inspect the Weather Bureau exhibit. This invitation was accepted, and, therefore, the exhibit brought the methods, instruments, etc., of the United States Weather Bureau to the attention of those most interested in meteorological work.

It was the special effort of those connected with the exhibit to explain and set forth in the strongest and clearest light possible the aims and methods of the United States Weather Bureau, and its practicability and great economic value to the people of the United States and of North America. Special stress was given to the great importance and the value of its weather forecasts and warnings.

It is to be regretted that on account of the expense and lack of funds for the necessary cablegrams the daily weather map of the United States, as originally planned, could not have been printed and issued daily¹ in connection with the exhibit. It is also to be regretted that a concise pamphlet or catalogue of the exhibit could not be prepared and printed for distribution, as there was a great demand for something of this kind.

As a result of the visit of the Jury of Awards and their critical examination of our exhibit the United States Weather Bureau was awarded a *Grand Prix*. Gold medals were awarded to two officials of the Weather Bureau, viz: Prof. C. F. Marvin for instruments, apparatus, and appliances, and to Prof. A. J. Henry for cloud photographs.

THE PROCEEDINGS OF THE PERMANENT INTERNATIONAL METEOROLOGICAL COMMITTEE.

From Professor Hildebrandsson, the new Secretary of the Permanent International Meteorological Committee, we have received the printed proceedings of the session of September 15. The committee elected Messrs. Pallazzo of the Central Office at Rome and Shaw of the Meteorological Office in London as new members to replace Messrs. Tacchini and Scott. Professor Hildebrandsson was elected Secretary of the committee. Professor Rucker was elected President of the Magnetic Committee. The directors of magnetic observatories are invited to send regularly to the secretary a list of the days that they consider to have been magnetically calm; these lists will be distributed. The cloud committee expresses the wish that the directors of meteorological observatories shall make simultaneous observations of the clouds at periods to be fixed in advance by the committee on aeronautics.

The committee on aeronautics expresses the opinion that it is desirable that military establishments for ballooning and meteorological institutions in general, be invited by their respective governments to participate in these international ascensions; this request will be communicated by the French Government to all other nations through diplomatic channels.

The subcommittee on telegraphy recommends the following: By reason of the advantages already obtained by extending the radial (i. e., circuit) system into neighboring countries, the subcommittee has decided to propose to the International Meteorological Committee to take the proper steps to form, as soon as possible, a committee composed of official representatives of the participating states, and instructed to confer with the international telegraphic bureau at Berne in order to find the most appropriate means of improving the service of meteorological dispatches.

¹This will, however, be done at the Pan-American Exposition to be held at Buffalo in 1901, when a complete exhibit of the magnitude and importance of the work of the Weather Bureau will be made.—Ed.

OSCILLATIONS OF LAKE LEVEL.

Referring to Professor Henry's article in the MONTHLY WEATHER REVIEW for May, Prof. F. A. Forel, of Morges, writes to him as follows:

I am very much pleased with your excellent study on the frequent lowerings of the level of Lake Erie, caused by the winds. On our Lake Lemman, where the local conditions are less favorable, I have not observed a similar change of more than 12 centimeters. (See Lemman, Vol. II, p. 29.) You found, the 25th of May, 1900, a change of level of 25 centimeters. This is superb.

However, what interests me still more are your seiches, viz, the balancing oscillations in the water of the lake as a whole. You give very fine examples of uninodal oscillations, with opposing balancings at the two extremities of the lake on the 27th, 28th, and 29th of March: duration of the period about fifteen hours.

On the other hand, on the 26th and 27th you observed a binodal oscillation with parallel movements at the two extremities of the lake, consequently with a node in the middle of the lake; duration of the period about ten hours.

I am very much puzzled by this strange relation of ten to fifteen hours in the duration of the uninodal and binodal periods; according to theory the relation should be as 1 to 2. But in practice we obtain slightly different relations, sometimes larger and sometimes smaller: Lake Lemman, 2.07; Lake Constance (Boden See), 1.98; Lake Zurich, less than 2.00; Lake George, 1.82; Lake Lucerne (four Cantons), 1.83, etc. (See Lemman, II, p. 162.) But so large a difference as that of Lake Erie (1.5) we have never yet observed.

I am also very much astonished to see the rapidity with which the binodal oscillation disappeared on the evening of March 27. There was again a slight trace on the Buffalo curve at 10 p. m. of the 27th, then all vanished and gave place to a simple uninodal oscillation. In our lakes, Lemman in particular, the series of seiches continue much longer.

I have just tried to apply the computations of P. du Boys (Lemman II, p. 83) to your Lake Erie, basing my calculations on the hydrographic chart which you sent me. I obtained for the uninodal seiche 16.9, which is a little more than the rises of the 28th of March give us, but the difference does not exceed the limits of error of this method.

Your observations are very interesting: they give us the *longest oscillations that have ever been accurately measured up to the present time on any body of water*, 400 kilometers, following the curves of the principal axis of the lake. I shall rejoice to see the continuation of your observations on this subject. If you could have made for me some tracings of the finest series of your uninodal and binodal seiches they would be of great interest to me as well as to those of my colleagues among the Swiss naturalists who are studying the phenomena with me.

I should very much like to be able to send you the memoirs published by myself on this phenomenon, but unfortunately the supply of most of them is exhausted. I have not more than four or five to send you. You will, however, find a general and complete summary of my theory on seiches in Volume II of my monograph: *Le Lemman*, pages 39-213.¹ I can but believe that this work will be found in some one of the libraries in your city, and that you can have access to it.

CORRECTION.

Dr. N. E. Dorsey requests that the words "of the atoms or corpuscles," unfortunately inserted by the Editor, and overlooked in correcting the proof, (September REVIEW, page 383, column 2, line 14) be struck out. "On the elastic solid theory of light the luminiferous ether is treated as a *continuous* medium; not as one composed of discrete particles as the words atoms or corpuscles imply."

WEATHER BUREAU MEN AS INSTRUCTORS IN METEOROLOGY.

Since preparing the article on this subject published in the MONTHLY WEATHER REVIEW for August we have received several additional letters, from which we make the following extracts:

Mr. B. S. Pague, Local Forecast Official, says:

I engaged in the work of public lectures in the autumn of 1889, when my first address was at a Farmers' Institute held in Oregon City, Clacka-

¹F. A. Forel. *Le Léman*. Monographie Limnologique. T. I., 1892; II, 1895, and Tome III in preparation. Lausanne, Librairie Rouger.

mas County, Oreg. During the winter of 1889-90 I delivered several addresses at farmers' institutes, and during the following nine years made many such addresses, principally in the State of Oregon. In 1893-94 I delivered a lecture at Stanford University, Cal., one at the State University of California, and one at Santa Clara, Cal., in addition I made some four or five addresses of a more popular nature before the Normal School, High School, Academy of Sciences, &c., in San Francisco. The lectures at Stanford and at the State University were the first delivered at these places by a Weather Bureau official. For the lecture at the State University I had some 30 or 40 stereopticon slides made from daily weather maps, and these I used to illustrate my lecture; these slides are now used by the official in charge of the San Francisco office, for illustrated lecture work. From 1894 to 1900 I made many addresses in Oregon on the subject of The Weather Bureau and its Work. I have addressed the students of the State Agricultural College of Oregon on various occasions, the State Grange, the great summer Chataqua meetings at Gladstone, Oreg., farmers' institutes, dairy meetings, horticultural meetings, State, county, and district fairs, stockmen's conventions, fishermen's conventions, miners' conventions, State medical conventions, Pacific Coast Dental Association, Fruit Growers' Union, chambers of commerce, boards of trade, and academies of science. These lectures covered a wide range, but all showed the direct effect which the Weather Bureau has upon all industries.

In addition to the foregoing I made a specialty of having classes from public schools, colleges, etc., visit the office at Portland, Oreg., when instruments were shown and the practical work of the Bureau thoroughly explained.

* * * * *

I have at the present time several invitations to make addresses in this city, Detroit, Mich., three of which I shall now mention: One to be delivered as one of a course of lectures given in the auditorium of the Masonic Temple, under the auspices of the chapter masons, to masons and their friends; the second before the Unity Club of the Unitarian Church, being one of a course of lectures on various subjects under the general title The Progress and Development of the Century, my subject being Meteorology, and the third to be given before the teachers of the public schools in this city.

Mr. John R. Weeks, Observer Weather Bureau, writes from Fort Smith, Ark., saying that a series of lectures on meteorology and especially cloud forms, is being arranged for by Prof. J. E. Hallimen, instructor in physical geography at the high school. Mr. Weeks adds that this is the first year that such work has been undertaken in this city, and that this awakened interest in the work of the Bureau "has been without any suggestion or solicitation on my part, although it had been my intention to broach the matter as soon as opportunity offered."

Prof. H. J. Cox, in charge of the Chicago station, says:

In the three higher grades of the Chicago public schools instruction is given by the teachers each morning upon popular and elementary meteorology, and in the high schools, during the course, in physiography. Professor Salisbury, at the Chicago University, gives lectures upon meteorology and uses Professor Davis's meteorology as a textbook. J. Paul Goode also delivers lectures upon the subject at the university during each summer quarter. Other schools and private academies in this city give much attention to the subject, and during the entire instruction the daily weather maps are furnished by this office; sometimes, in special cases, as many as fifty per day have been furnished for a period of a week. These classes almost invariably come to this office for additional instruction, and it is not unusual, as often as once a week, for either myself or one of my assistants to give a lecture at the Weather Bureau upon the subject of forecasting, the movement of storms, and the working of the instruments, to these visiting classes. In fact, the demand for this instruction has been so great that it has been found necessary to curtail these visits to some extent, as they interfere with the office work.

For several years it has been the custom for the officials of the Chicago office to give lectures before various societies in this city. Last winter Mr. Linney delivered a lecture before the Chicago Geographic Society, and I gave an informal talk before a South Side school about the same time. I have accepted an invitation from the Chicago Academy of Science to deliver a lecture next January. Such work, while important in itself, can not well be extended without interfering with important Weather Bureau work. We give encouragement to those who desire to study the science, and we feel that there is great interest taken in the subject in this city.

I may say, in conclusion, that I was probably the first observer of the Weather Bureau who gave regular instruction and lectures upon meteorology at an institution of learning. During the years 1887 and 1888, while

at Northfield, Vt., I was a member of the faculty of the Norwich University, and inaugurated a course in meteorology, which has been continued to the present day.

Mr. S. S. Bassler, Local Forecast Official at Cincinnati, reports that the schools in Cincinnati, now under the superintendence of Dr. R. G. Boone, are taking a lively interest in meteorology, in connection with "nature studies." He has prepared a short paper on this subject, to be read on December 4. He will also speak before the teachers of Bellevue, Ky., on December 14, 1900, and in Covington, Ky., in February, 1901.

Mr. W. M. Fulton, Observer in charge, Knoxville, Tenn., addressed the farmers' institutes at Rogersville, Tenn., in October, and again the institute at Newmarket, Tenn., on November 9 and 10.

TRAINING NEEDED TO BECOME INVESTIGATORS.

It is a very common mistake to think that education consists wholly in learning at school or college all that is worth knowing relative to the past achievements and present condition of knowledge. Those who have thus acquired eminent attainments in knowledge receive the college degrees of B. A. or M. A., and enter upon active life with far greater mental resources than those who have not been so highly privileged. Their knowledge stands them in good stead in both their social and business relations. But there is another much smaller class of students who desire, not merely to learn about all that is known but also to add to our knowledge. They propose not to be merely merchants or teachers, or popular writers and lecturers; they are not content with the field of applied science, but aspire to be original investigators, and to push forward the conquests of man over the hidden laws of nature. Every one must now recognize that the whole creation is an assemblage of problems in physics, and that we as yet know but little compared with what there is still to be found out. The inventions, and the arts that constitute our modern civilization, are but the inevitable application to human needs of the knowledge that the investigator has wrested from the secret chambers of nature. Those who contemplate becoming investigators in any field of science should, if any way possible, take the courses of instruction that are offered in most of our larger universities known as post graduate courses, and which usually lead to the degree of Doctor of Philosophy or Doctor of Science; these degrees should never be given as honorary titles. The importance and character of the training required for these degrees is enthusiastically described in the following article by Prof. Paul C. Freer of the University of Michigan, which we copy from the Michigan Alumnus for March, 1900, pp. 238-240:

A fundamental misconception of the meaning of research work is too often apparent. Untrained beginners are set at some hackneyed problem which involves little thought on their own part or on that of the proposer, and no knowledge of the general aspects of the subject; the results, even if the ultimate end is accomplished, being of little value to science as a whole—and yet these tyros are told that they are, and suppose themselves to be, engaged in original investigation. For this reason all competent workers should continually reiterate the fact that training of the most careful and conscientious kind, not only in the immediate subject of interest, but also in all of the branches related to it, must always precede any endeavor to enter into new and untried paths. The better the preliminary education the better the results, provided always that the worker has the proper capabilities and enthusiasm. If the impulse and spirit are lacking the attempt to do anything had better be abandoned. No good ever came from compulsion either from without or within.

True research does not occupy itself merely with the observation of a few details which of necessity suggest themselves in conjunction with any subject, but it must also connect the facts which it has estab-